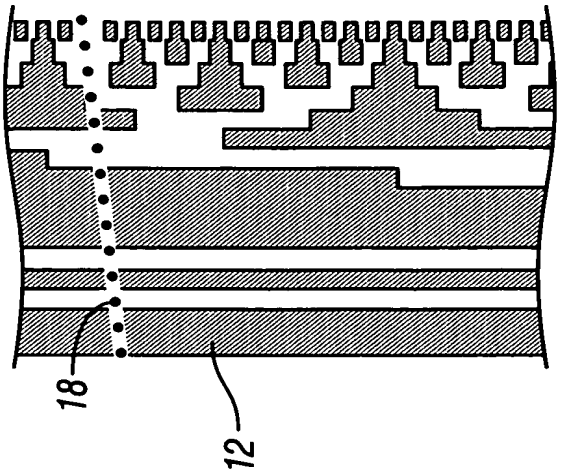
18
12

FIG. 1B

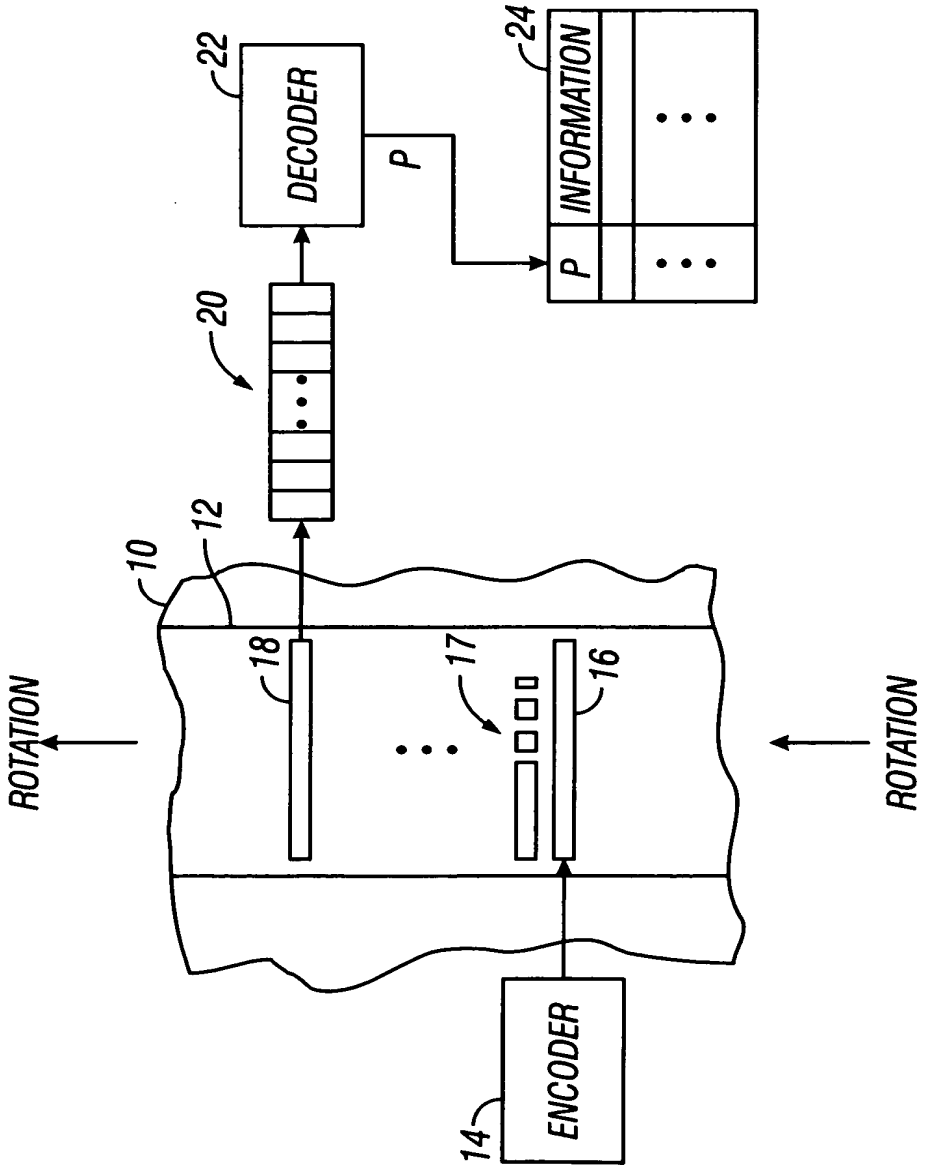
ROTATION
ROTATION
10
12
18
17
16
20
22
DECODER
P
24
INFORMATION
P
14
ENCODER

FIG. 1A

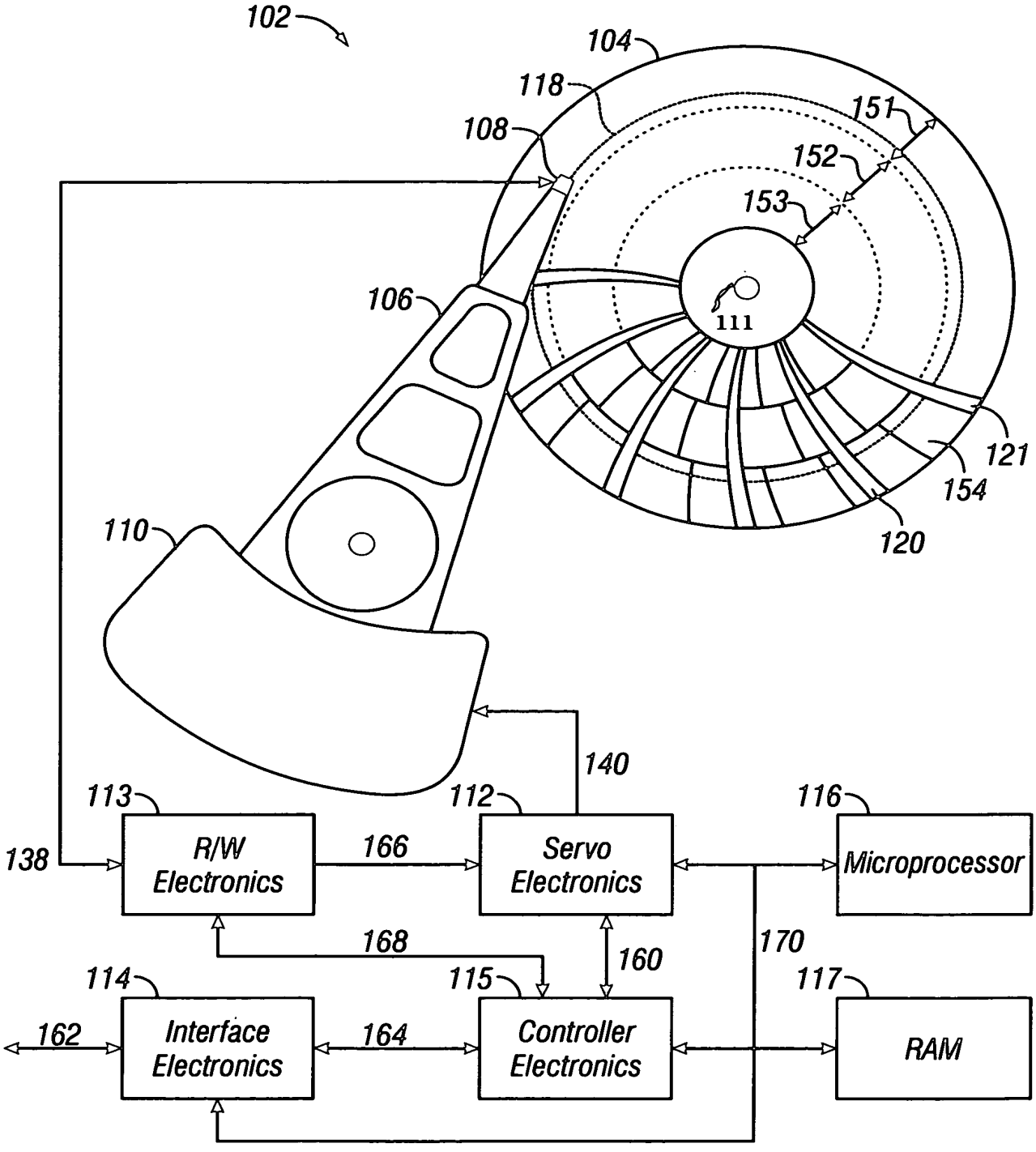

FIG. 1C
(Prior Art)

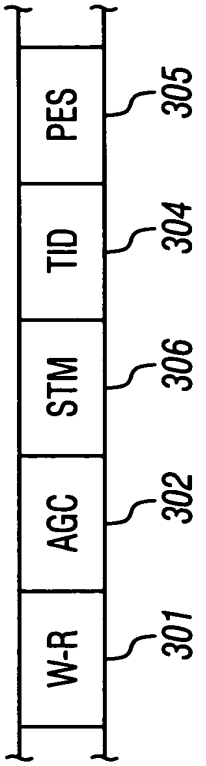

FIG. 2B
(Prior Art)

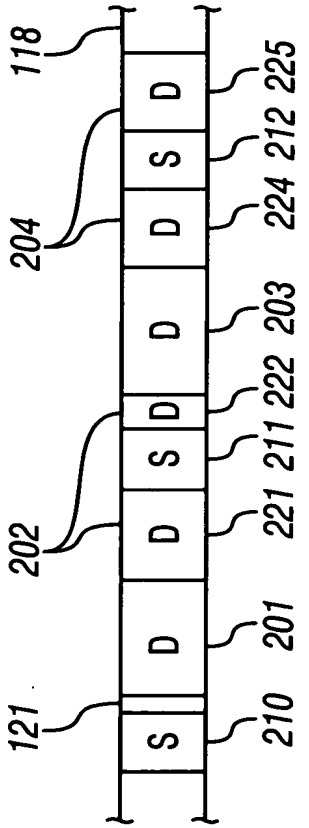

FIG. 2A
(Prior Art)

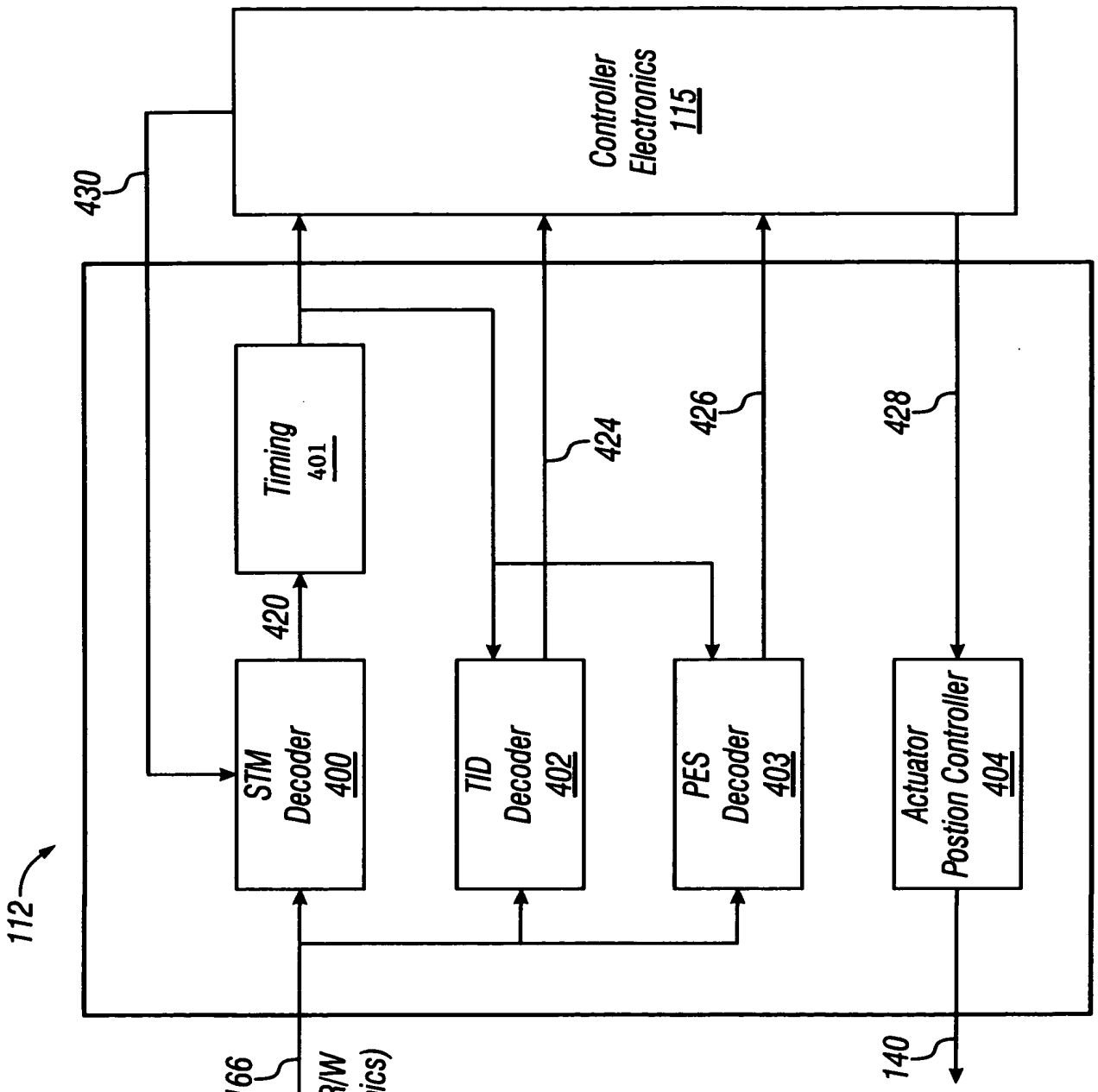

FIG. 3
(Prior Art)

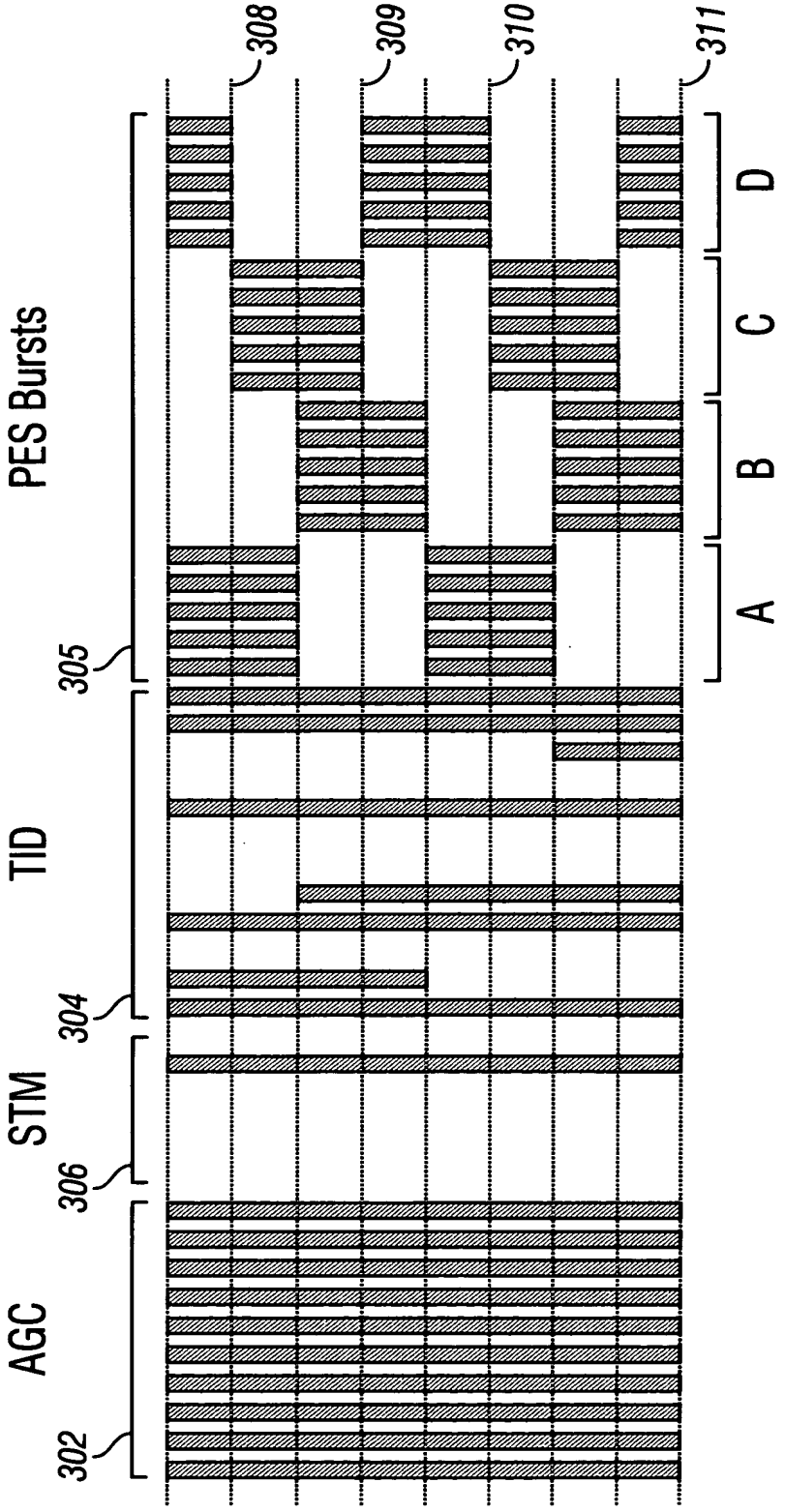

FIG. 4
(Prior Art)

Track Number	Binary Track ID
0	0 1
1	1 1
2	1 0
3	0 0

FIG. 5A

Track Number	Binary Track ID
0	0 1 1
1	1 1 1
2	1 0 1
3	1 0 0
4	1 1 0
5	0 1 0
6	0 0 0
7	0 0 1

FIG. 5B

Track Number	Original Track Number	Prefix Bit	Original Gray Code	Suffix Bit
7	0	0	01	0
8	1	0	11	0
9	2	0	10	0
10	2	0	10	1
11	1	0	11	1
0	0	0	01	1
1	0	1	01	1
2	1	1	11	1
3	2	1	10	1
4	2	1	10	0
5	1	1	11	0
6	0	1	01	0

FIG. 6A

Track Number	Binary Track ID
0	0011
1	1011
2	1111
3	1101
4	1100
5	1110
6	1010
7	0010
8	0110
9	0100
10	0101
11	0111

FIG. 6B

Number of Bits	Number of Codewords	Code Rate
1	2	1
2	4	1
3	8	1
4	12	0.8962
5	32	1
6	44	0.9099
7	104	0.9572
8	140	0.8912
9	320	0.9247
10	428	0.8741
11	968	0.9017
12	1292	0.8613
13	2912	0.8852
14	3884	0.8517
15	8744	0.8729
16	11660	0.8443
17	26240	0.8635
18	34988	0.8386
19	78728	0.856
20	104972	0.834
21	236192	0.85
22	314924	0.8302
23	708584	0.845
24	944780	0.8271

FIG. 7

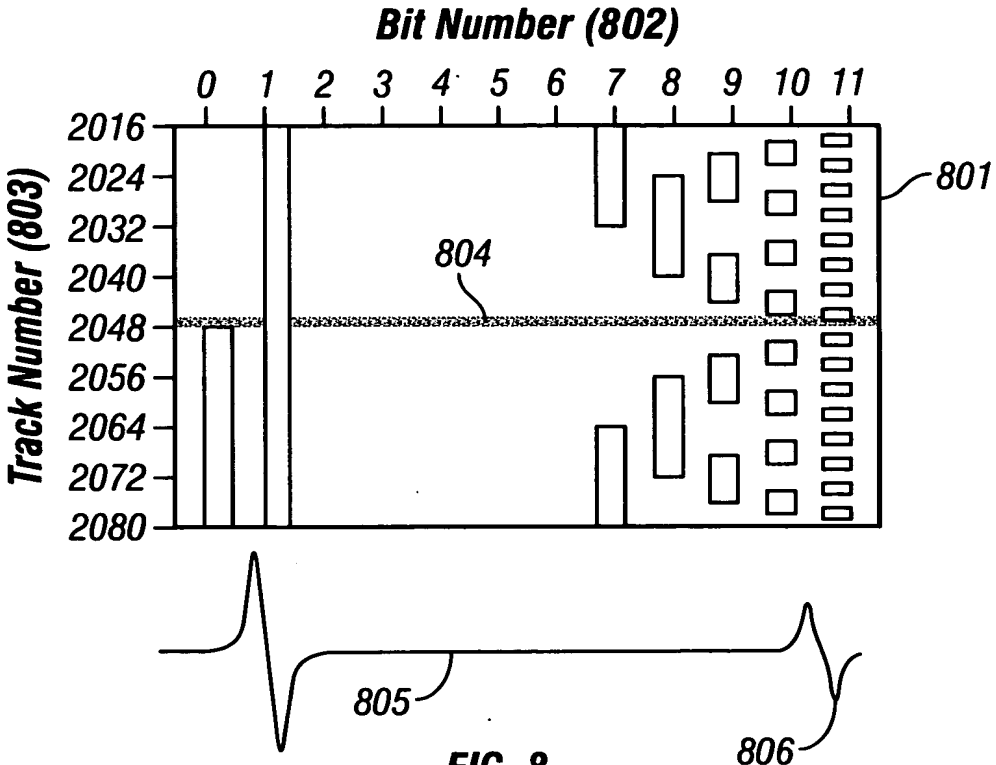
Bit Number (802)
0 1 2 3 4 5 6 7 8 9 10 11
Track Number (803)
2016
2024
2032
2040
2048
2056
2064
2072
2080
801
804
805
806

FIG. 8

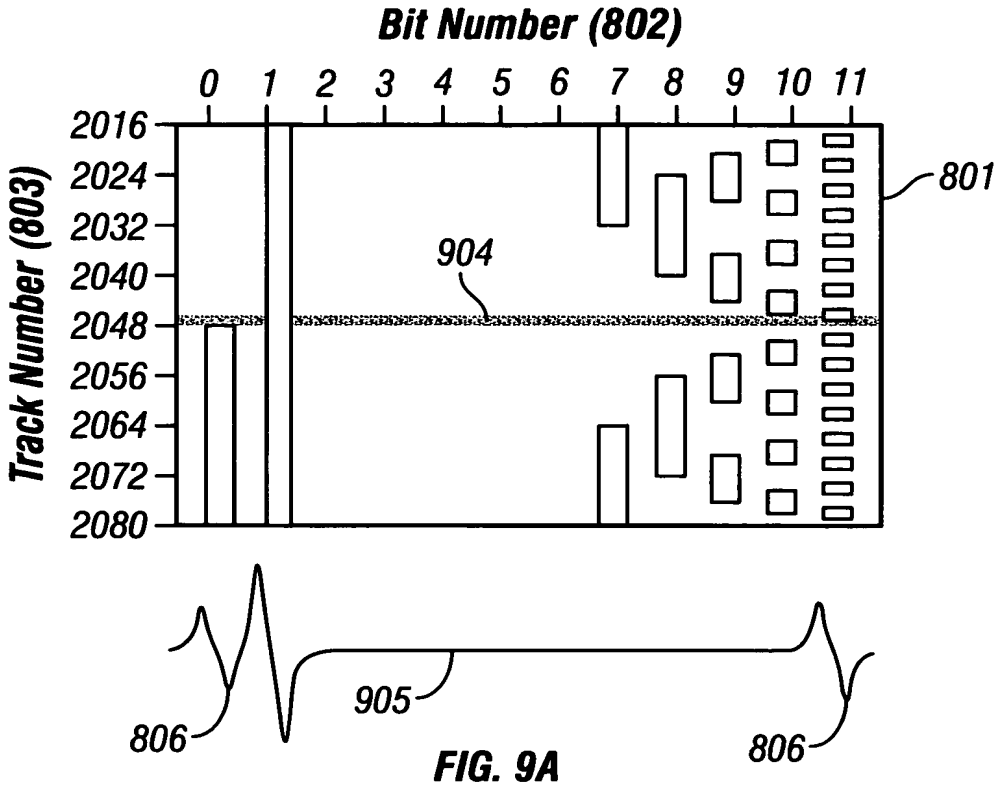
Bit Number (802)
0 1 2 3 4 5 6 7 8 9 10 11
Track Number (803)
2016
2024
2032
2040
2048
2056
2064
2072
2080
801
904
905
806
806

FIG. 9A

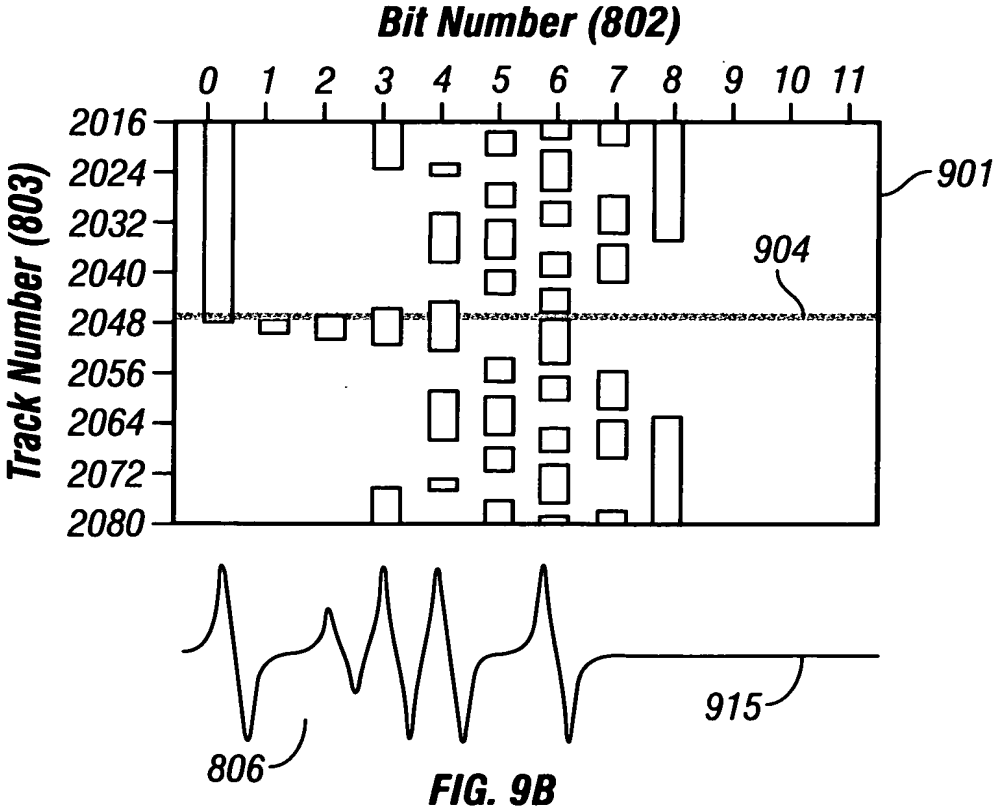
Bit Number (802)
0 1 2 3 4 5 6 7 8 9 10 11
Track Number (803)
2016
2024
2032
2040
2048
2056
2064
2072
2080
901
904
915
806

FIG. 9B

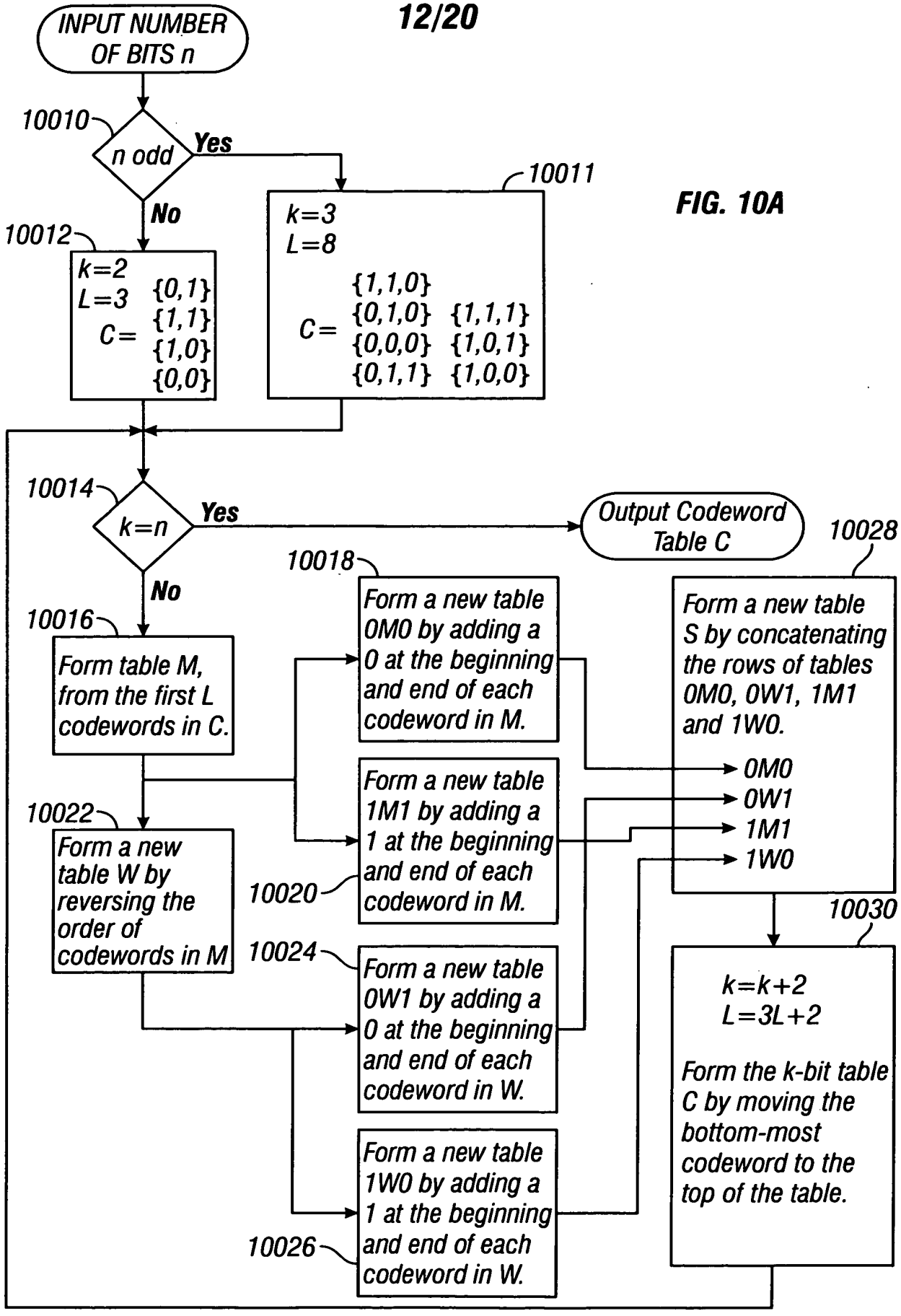
INPUT NUMBER OF BITS n
10010
n odd
Yes
No
10011
k=3
L=8
C= {1,1,0} {0,1,0} {1,1,1} {0,0,0} {1,0,1} {0,1,1} {1,0,0}
10012
k=2
L=3
C= {0,1} {1,1} {1,0} {0,0}
10014
k=n
Yes
Output Codeword Table C
10028
No
10016
Form table M, from the first L codewords in C.
10018
Form a new table 0M0 by adding a 0 at the beginning and end of each codeword in M.
Form a new table S by concatenating the rows of tables 0M0, 0W1, 1M1 and 1W0.
0M0
0W1
1M1
1W0
10022
Form a new table W by reversing the order of codewords in M
Form a new table 1M1 by adding a 1 at the beginning and end of each codeword in M.
10020
10030
10024
Form a new table 0W1 by adding a 0 at the beginning and end of each codeword in W.
k=k+2
L=3L+2
Form the k-bit table C by moving the bottom-most codeword to the top of the table.
Form a new table 1W0 by adding a 1 at the beginning and end of each codeword in W.
10026

FIG. 10A

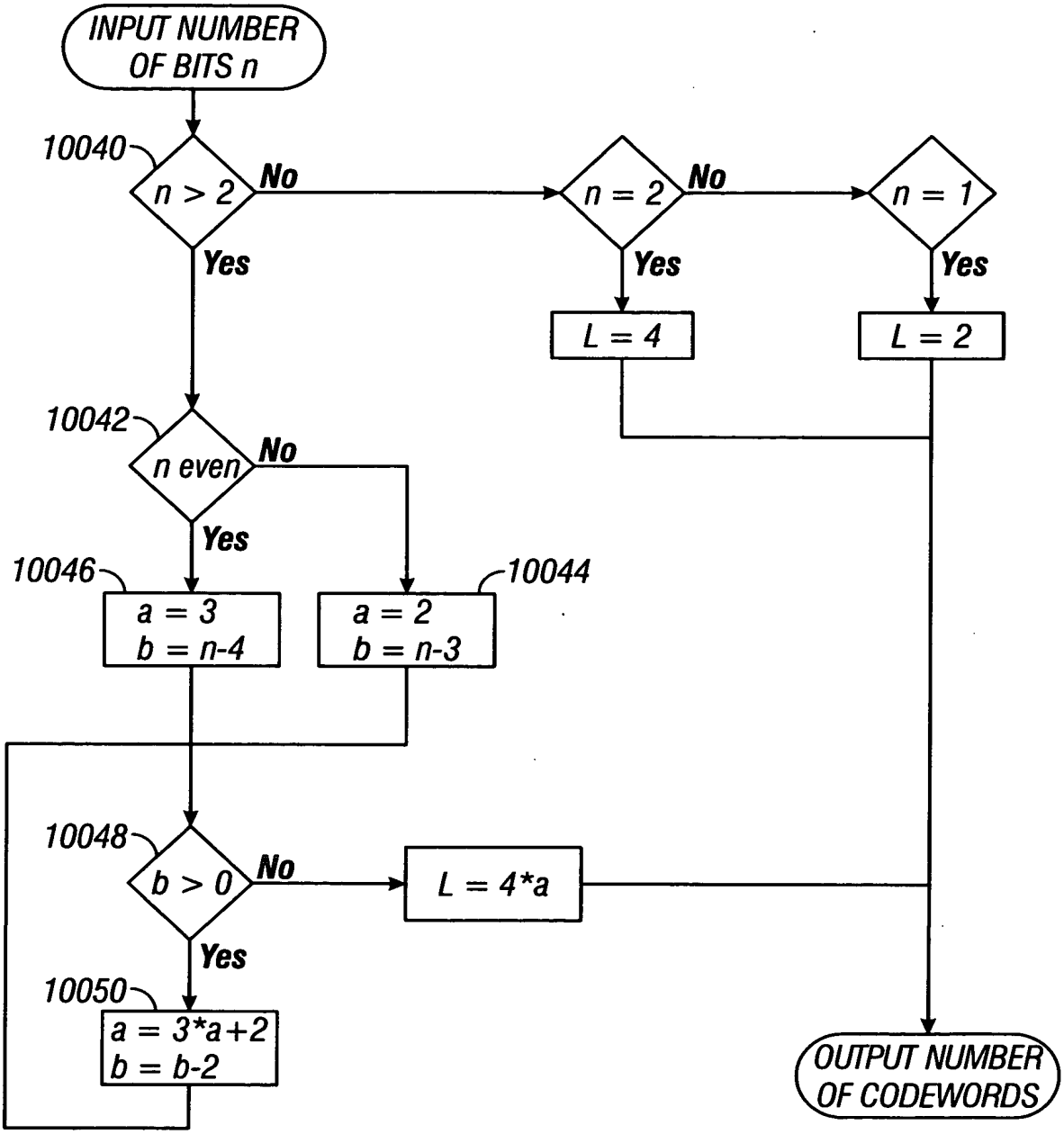
INPUT NUMBER OF BITS n
10040
n > 2
No
n = 2
No
n = 1
Yes
Yes
Yes
L = 4
L = 2
10042
n even
No
Yes
10046
a = 3
b = n-4
10044
a = 2
b = n-3
10048
b > 0
No
L = 4*a
Yes
10050
a = 3*a+2
b = b-2
OUTPUT NUMBER OF CODEWORDS

FIG. 10B

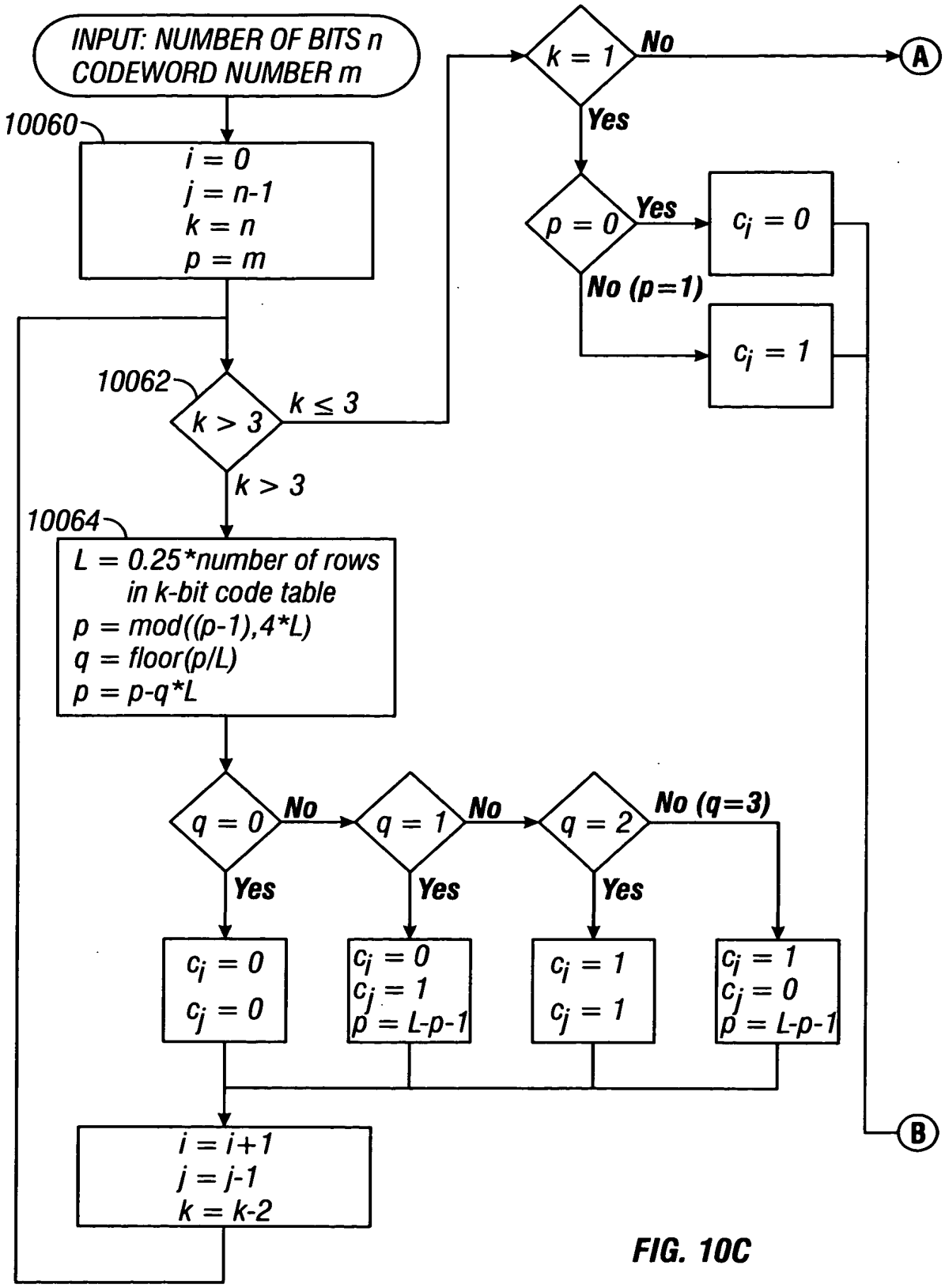
INPUT: NUMBER OF BITS n
CODEWORD NUMBER m
10060
i = 0
j = n-1
k = n
p = m
10062
k > 3
k ≤ 3
k > 3
10064
L = 0.25*number of rows in k-bit code table
p = mod((p-1),4*L)
q = floor(p/L)
p = p-q*L
q = 0
No
q = 1
No
q = 2
No (q=3)
Yes
Yes
Yes
c_i = 0
c_j = 0
c_i = 0
c_j = 1
p = L-p-1
c_i = 1
c_j = 1
c_i = 1
c_j = 0
p = L-p-1
i = i+1
j = j-1
k = k-2
k = 1
No
A
Yes
p = 0
Yes
c_i = 0
No (p=1)
c_i = 1
B

FIG. 10C

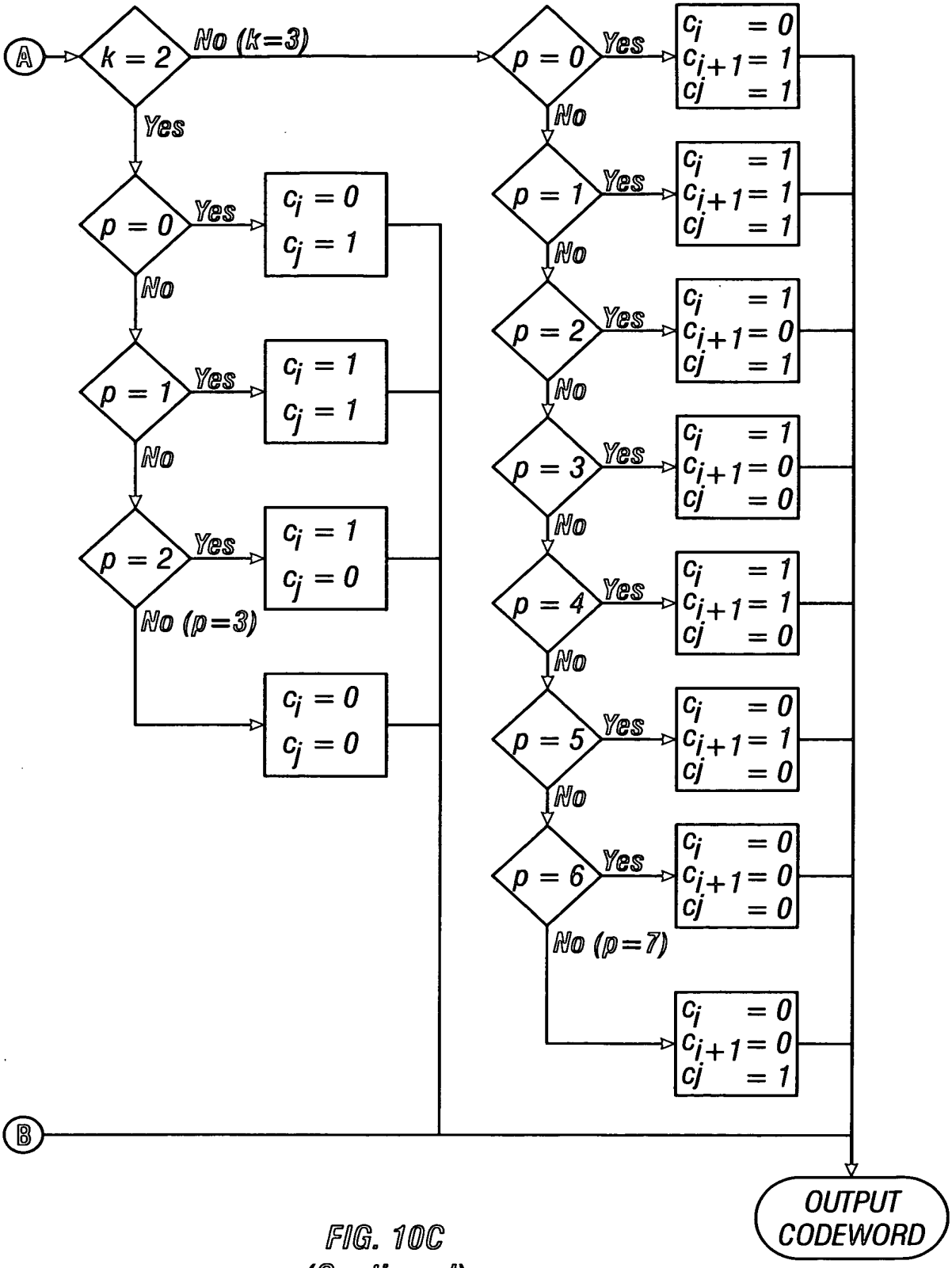

FIG. 10C
(Continued)

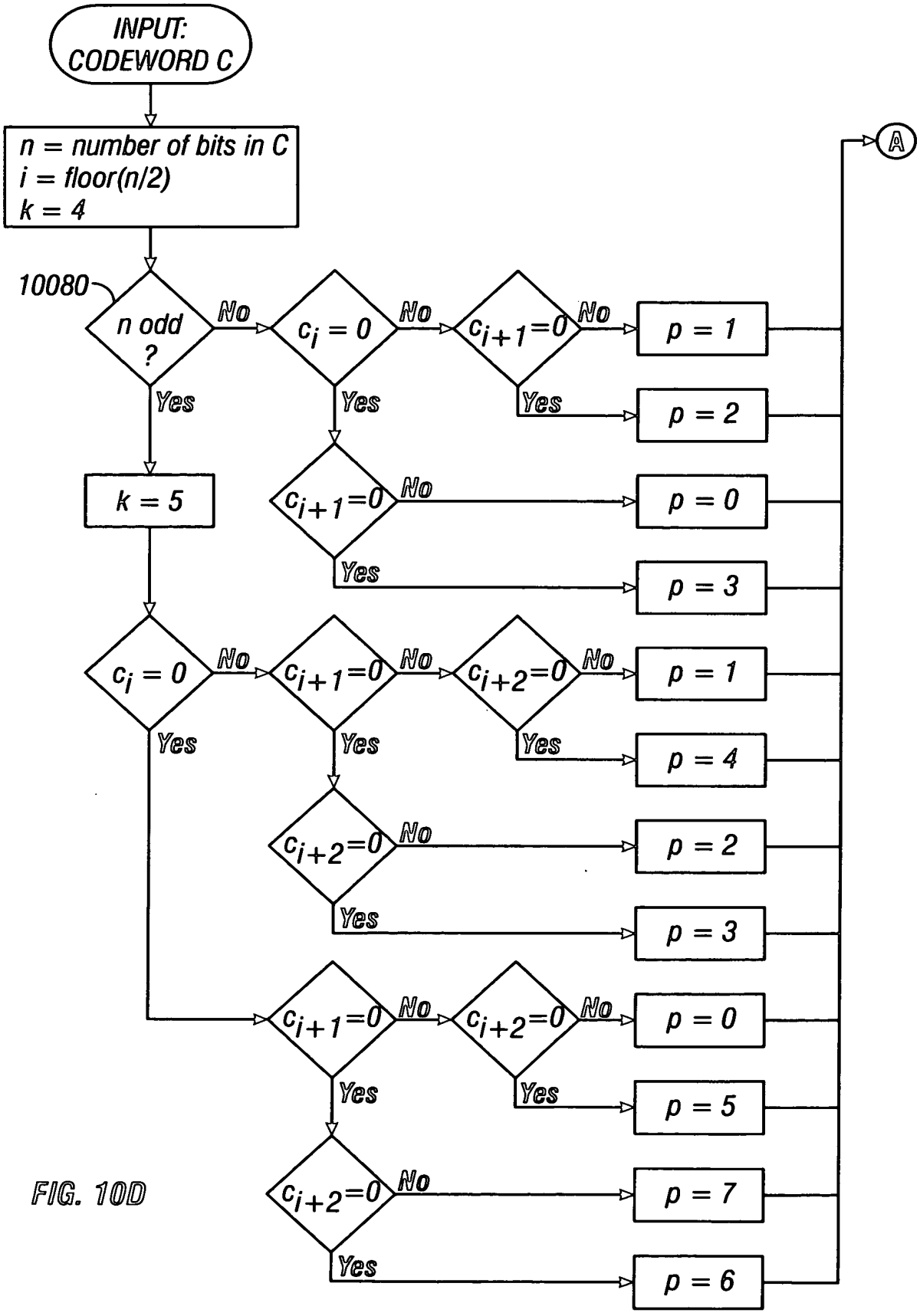
INPUT: CODEWORD C
n = number of bits in C
i = floor(n/2)
k = 4
10080
n odd ?
No
Yes
$c_i = 0$
$c_{i+1}=0$
$c_{i+2}=0$
k = 5
p = 0
p = 1
p = 2
p = 3
p = 4
p = 5
p = 6
p = 7
A

FIG. 10D

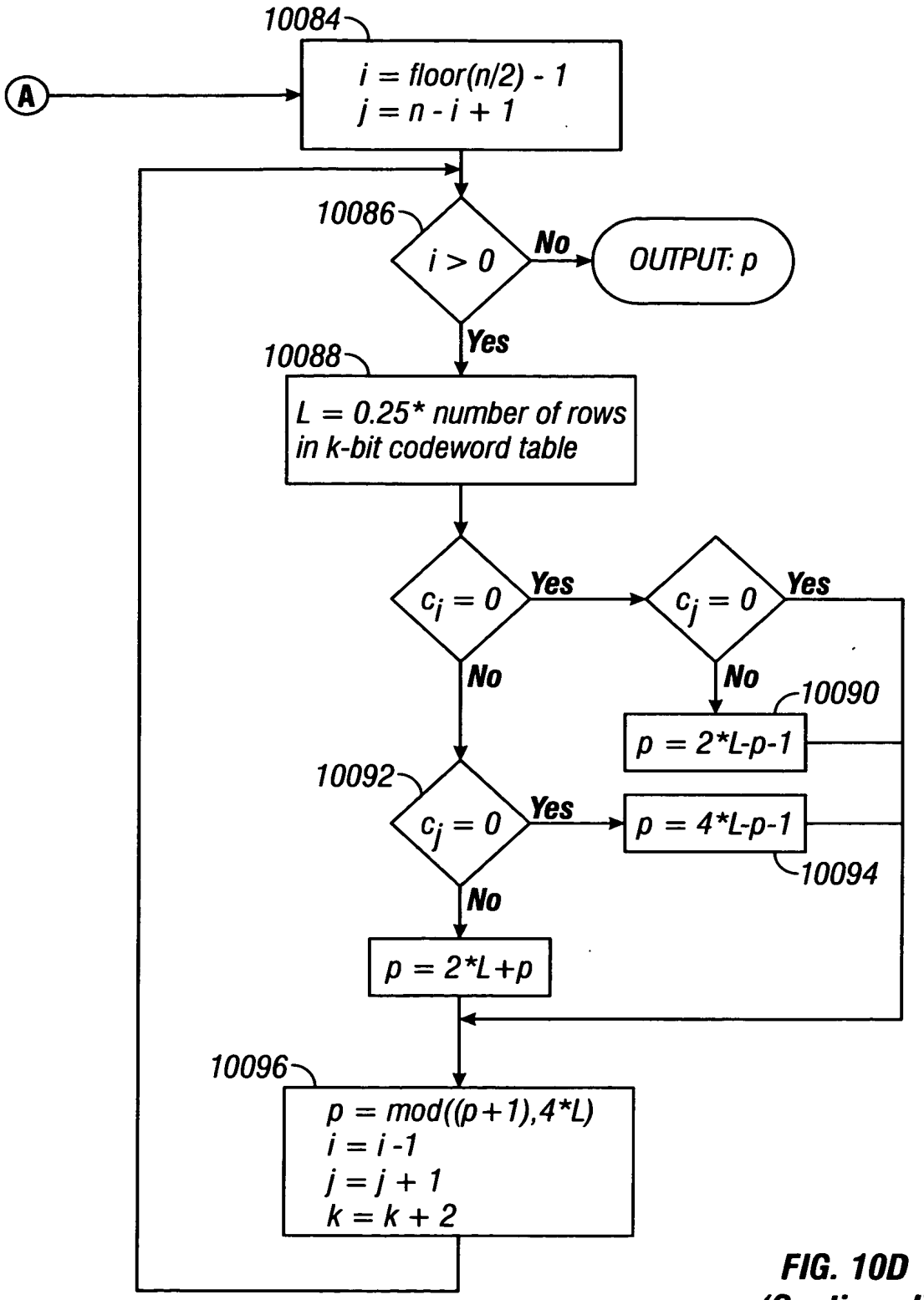

FIG. 10D
(Continued)

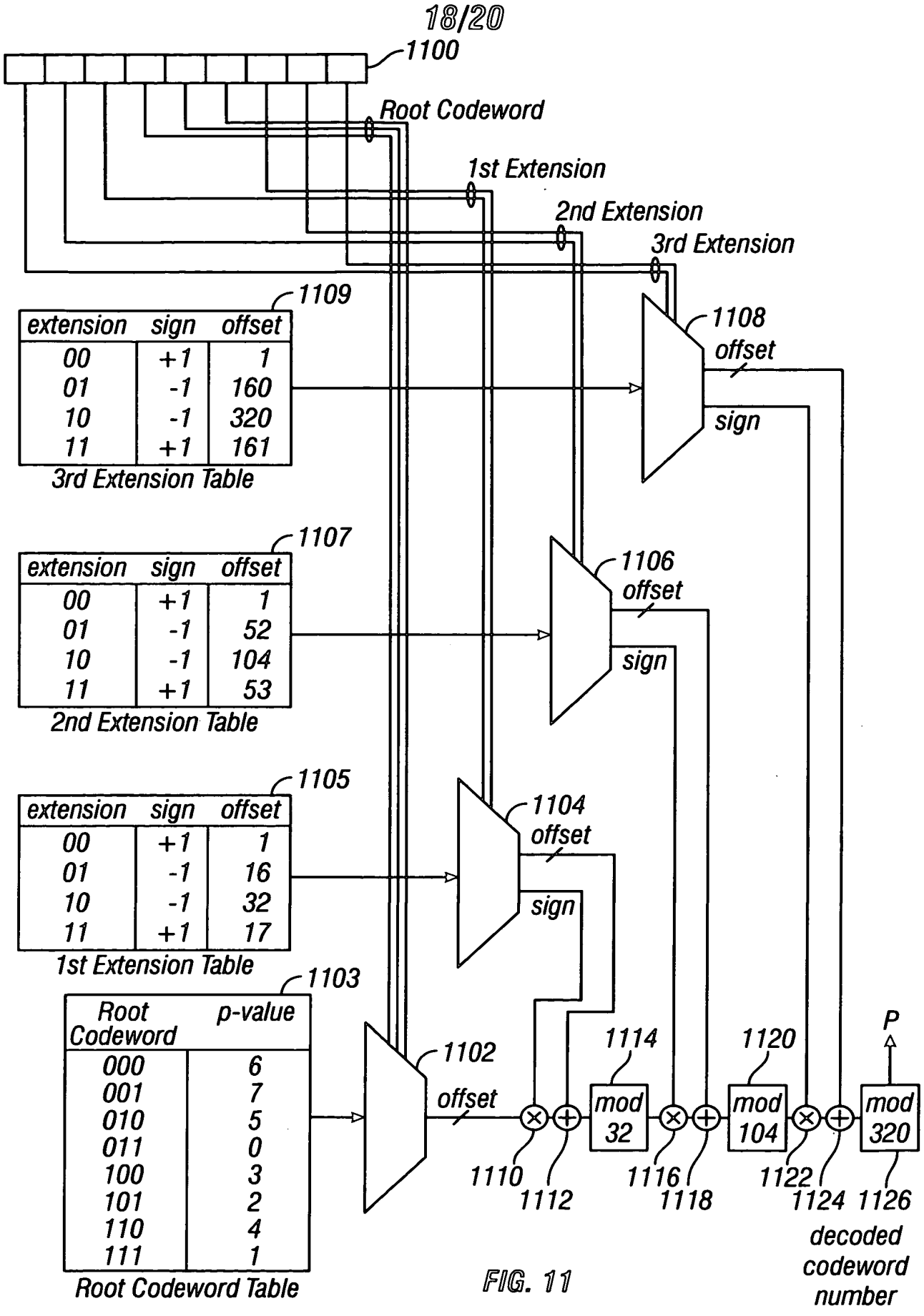
1100
Root Codeword
1st Extension
2nd Extension
3rd Extension
1109
extension sign offset
00 +1 1
01 -1 160
10 -1 320
11 +1 161
3rd Extension Table
1108
offset
sign
1107
extension sign offset
00 +1 1
01 -1 52
10 -1 104
11 +1 53
2nd Extension Table
1106
offset
sign
1105
extension sign offset
00 +1 1
01 -1 16
10 -1 32
11 +1 17
1st Extension Table
1104
offset
sign
1103
Root Codeword p-value
000 6
001 7
010 5
011 0
100 3
101 2
110 4
111 1
Root Codeword Table
1102
offset
1114
mod 32
1120
mod 104
P
mod 320
1110
1112
1116
1118
1122
1124
1126
decoded codeword number

FIG. 11

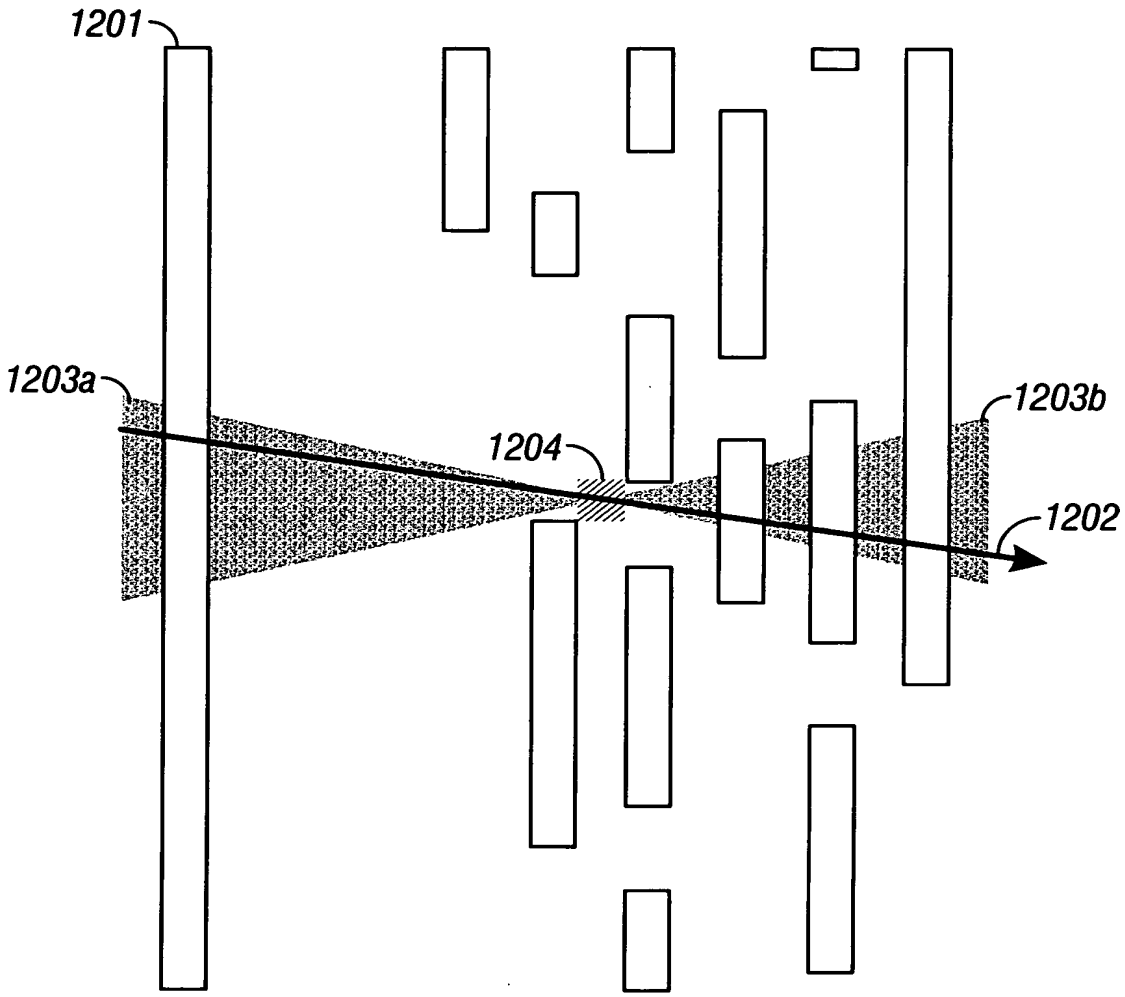

FIG. 12

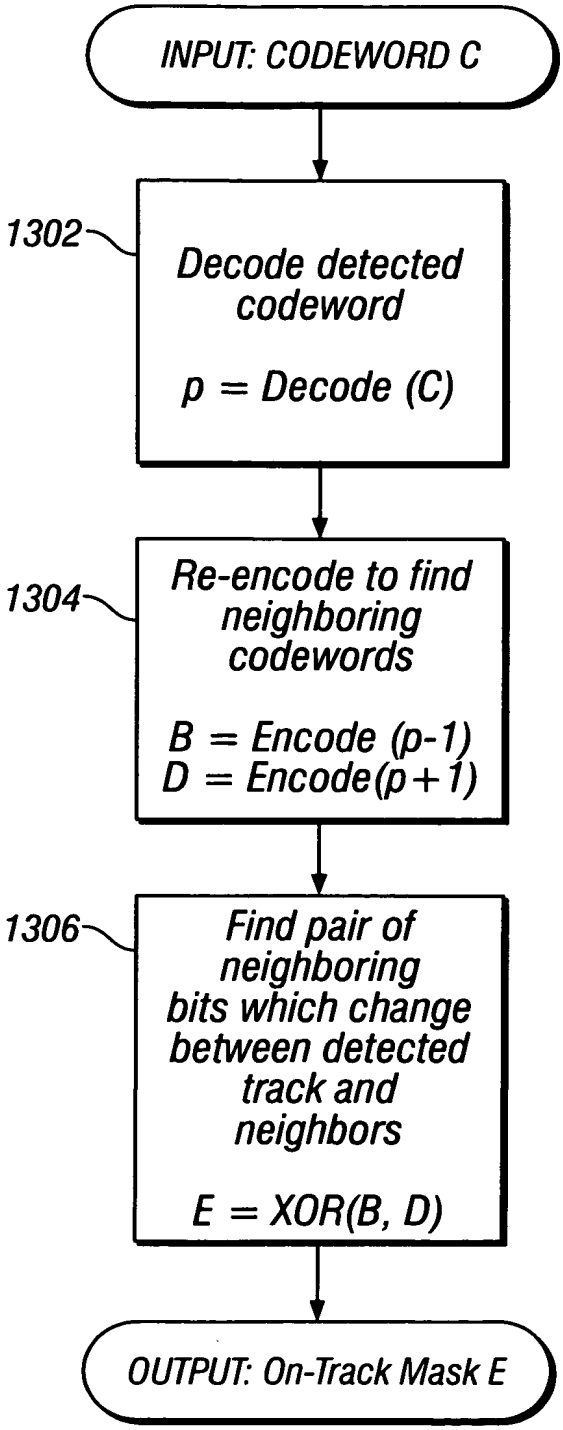
INPUT: CODEWORD C
1302
Decode detected codeword
p = Decode (C)
1304
Re-encode to find neighboring codewords
B = Encode (p-1)
D = Encode(p+1)
1306
Find pair of neighboring bits which change between detected track and neighbors
E = XOR(B, D)
OUTPUT: On-Track Mask E

FIG.13